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Reducing Childhood Pedestrian Injuries: Individual Risk Factors (Chapter 3)

Katherine Kaufer Christoffel
Chicago, IL

Lizette Peterson

David DiLillo
University of Nebraska-Lincoln, ddilillo@unl.edu

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Reducing Childhood Pedestrian Injuries: Proceedings of a Multidisciplinary Conference

Editors

Richard A. Schieber, MD, MPH

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
National Center for Injury Prevention and Control

Maria E. Vegega, PhD

U.S. Department of Transportation
National Highway Traffic Safety Administration
Office of Traffic Injury Control Programs

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Centers for Disease Control and Prevention
Julie L. Gerberding, MD, MPH
Director

National Center for Injury Prevention and Control
Sue Binder, MD
Director

Division of Unintentional Injury Prevention
Christine Branche, PhD
Director

National Highway Traffic Safety Administration
Jeffrey W. Runge, MD
Administrator

Traffic Safety Programs
Rose A. McMurray
Associate Administrator

Office of Traffic Injury Control Programs
Marilena Amoni, MS
Director

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Contributors[1]

Katherine Kaufer Christoffel, MD, MPH
Children's Memorial Hospital
Northwestern University School of Medicine
Chicago, IL

David DiLillo, PhD
Department of Psychology
University of Nebraska-Lincoln
Lincoln, NE

Lizette Peterson, PhD
Department of Psychological Sciences
University of Missouri-Columbia
Columbia, MO

[1]Affiliations at the time of publication

Chapter 3
Individual Risk Factors

Katherine Kaufer Christoffel, MD, MPH[2]
Lizette Peterson, PhD

Most factors influencing the risk of pedestrian injury for children are based on family considerations or community norms, not on individuals. Nevertheless, individual risk factors should be considered when planning prevention programs (Christoffel, Donovan et al. 1996). The potential importance of individual traits has been extensively studied in the hope of finding a factor that could be modified. Considerations of the individual are important because they largely define the child's risk of injury, even while walking with others. The causal sequence of a child walking to a particular site at a particular time where he or she is injured is at least partly unique to that child. Various prevention strategies that might successfully interrupt a specific causal sequence include approaches related to the individual.

Child Risk Factors

Several studies have shown that certain individual traits of a child (Table 3.1) are associated with increased risk of injury (Christoffel, Donovan et al. 1996; Pless, Peckham, and Power 1989; Agran et al. 1998). Together, these factors identify subpopulations of children who merit prevention programs. The most powerful risk factors among these are demographic: age, race, gender, social status, and community of residence, discussed in previous chapters. For the most part, these factors are not subject to change. Some interrelated factors that affect the risk of pedestrian injury include biopsychosocial development, physical attributes, personality, and habitual behavior patterns. Key individual risk factors for childhood pedestrian injury are listed on Page 23.

Biopsychosocial Development. Biopsychosocial development helps explain the marked variation in pedestrian injury rates and circumstances that occur with age (Schieber and Thompson 1996). The specific developmental attributes that influence the risk of injury have not all been defined, but surely include gross motor, cognitive, perceptual, emotional, judgmental, and social factors. It is clear that pedestrian skills develop during elementary school age. For example, elementary school children younger than eight years old, unlike older children, did not devise routes of travel near their school that were safe (Ampofo-Boateng et al. 1993). Vinjé (1981) articulated the complex manner in which various developmental factors influence a child's ability to respond to traffic challenges and skills training. He suggested that preoperational children (2 to 7 years old) lacked the ability to make precise judgments about traffic. This would indicate that behavioral training for children this age should be limiting and rigid, and include directives to: (1) stay away from the curb unless preparing to cross; (2) look in both directions to check for vehicles when crossing; (3) cross only when no vehicles are coming; and (4) stop and look at oncoming drivers, making eye contact when possible. It is not yet known whether such training would reliably reduce pedestrian crash rates. In fact, theoretically, a young child might be put at increased risk if allowed to cross unsupervised at this age, despite such training. It may be necessary to finely tailor pedestrian safety messages to a child's specific developmental level within several age brackets.

Physical Development. Several studies indicate the strong association between physical or gross motor development and pedestrian injury. Physical attributes, such as height, weight, and agility, affect a child's ability to see traffic and be seen by motorists (Schofer et al. 1995). Physical attributes also determine a child's walking speed (Sleight 1972) and the strategies available to help negotiate crossings. Physical limitations appear to reduce risk (Pless, Verreault and Tenina 1989). Although counterintuitive, children

[2]Topic presented at conference by the lead author of each Chapter.

Table 3.1 Individual Risk Factors for Child Pedestrian Injury

(Asterisks indicate topics for which substantial knowledge exists)

Demographic*
- Age
- Race/Ethnicity
- Gender
- Social Status
- Community of Residence

Biopsychosocial Development
- Gross Motor/Physical*
- Cognitive*
- Perceptual*
- Emotional
- Judgment
- Social

Physical Attributes
- Height*
- Weight
- Sensory Abilities
- Medical Problems
- Agility

Personality and Habitual Behavior
- Outgoing *v.* Shy
- Leader *v.* Follower
- Impulsive *v.* Passive
- Hyperactive *v.* Quiet
- Behavior in Traffic

Experience in Traffic
- General
- Specific Traffic Circumstances

Emotional State
- Social Situational
- Social Relationships (Peers, Supervisor)
- Physical Site

Adult Supervision*
- By Whom
- Content, including level of vigilance, proximity, and control
- Supervisor's awareness of child's developmental abilities
- Differences in supervision based on traffic site

between five and eight years old who have high self-estimates of physical agility appear to have increased, rather than decreased, risk of injury (Christoffel, Donovan et al. 1996). Plumert (1995) found that children in early elementary school overestimated their own abilities more often and to a greater extent than did adults completing the same psychomotor task. Six-year-old children with higher levels of overestimation sustained higher levels of medically-attended injury. Although the mechanism is not clear, children with high physical agility may overestimate their ability to move sufficiently, rapidly, and effectively on foot to avoid traffic, thus taking more chances in traffic than less agile children. When observed, children take longer to cross streets than they think. Also, more agile children may be allowed greater freedom in traffic, ignoring the fact that superior physical skill is not necessarily accompanied by superior judgment in traffic.

Cognitive Development. Several important cognitive skills are age-related. Young children may have difficulty focusing their attention on traffic, preferring to attend to other matters (Schieber and Thompson 1996). Even children who can recite the rule "Don't run out into the street" may dart out at times. Also, young children often misinterpret traffic signs. For example, a yellow sign with a child running may mean to a child that it is safe to cross the street, when in fact it is a warning to motorists that children may be present. Children's memory for even simple rules of traffic is unreliable. Grayson (1975a, 1975b) found that 39% of children observed did not even look into the street before crossing, even though they knew the rule to look before crossing.

Perceptual Development. Children's ability to locate sounds is poorer than that of adults (Sandels 1970), as is their judgment of the speed of an oncoming car (Vinjé 1981). Furthermore, children tend to detect objects in their peripheral vision less well and more slowly than adults (Lakowski and Aspinall 1969; David et al. 1986).

Behavioral Traits. Although widely expected to influence pedestrian injury risk, rigorous analyses have generally not found that behavioral traits have a profound influence. Across many studies, behavioral factors are not consistently or substantially associated with the risk of pedestrian injury, particularly when compared with the influence of demographic or environmental factors (Pless, Verreault, and Tenina 1989; Christoffel, Donovan et al. 1996).

Personality factors and habitual behavior patterns such as impulsivity and aggressiveness could affect a child's risk in traffic. Among a group of British children ages 8 to 11, boys who "never sat still" were 67% more likely to sustain a pedestrian or bicycling injury than other boys (Pless, Peckham, and Power 1989). However, aggressiveness and behavioral disturbances were not significantly associated with increased risk (Pless, Verreault, and Tenina 1989). Overall, the possible association between various psychological states and pedestrian injury occurrence has not received much attention by researchers, except perhaps in the context of reconstructing the sequence of events that led to a pedestrian injury (Christoffel and Schofer 1996).

Emotional Development. The emotional state of a child at a specific moment may shape his or her behavior by affecting the degree of attention to traffic or willingness to take risks. Relevant emotional domains for children include their feelings towards the situation or place that they are leaving or approaching (e.g., school or home); feelings about peers who accompany them, which may provoke a typical behavior such as daring or boasting; feelings towards a supervisor (whether or not present), which may affect the child's willingness to comply with traffic rules; and positive or negative attitudes toward the specific traffic situation at hand, based on knowledge, emotions, or both.

Supervision. Supervision is a key element of pedestrian injury prevention. Only 19% of children younger than 15 years old who were struck as pedestrians during a midblock dart-out were accompanied by an adult (Agran, Winn, and Anderson 1994). Poorly-supervised children were 2.6 times more likely to sustain a pedestrian injury than children who were adequately supervised (Pless, Verreault, Tenina 1989). And yet, the degree of supervision necessary to assure child safety in all circumstances is presently unknown. Parents appear to overestimate their children's abilities and vulnerabilities in traffic, at least until about 9 or 10 years of age (Dunne, Asher, and Rivara 1992). The permissible duration of supervision for various activities, including playing in the vicinity of traffic, varies among well-meaning adults. In one study, the opinions of mothers, child protective services workers, and medical personnel differed concerning the duration of time an infant or child could safely be left unsupervised in the home, yard, neighborhood, or near the street (Peterson, Ewigman, and Kivlahan 1993). Even specifying the relative degree of hazard in each of these sites did not result in unanimity of opinion. For example, adults reported that they would allow children between ages six and eight years to be unsupervised as long as 30 minutes when playing near a street with little traffic. Risk is partly determined by their style of adult supervision, characterized by degree of proximity and physical contact, and the number of other children they supervise simultaneously. However, most research studies have not objectively or systematically defined supervision well enough to make inferences useful for planning injury prevention programs. A notable exception is the more precise taxonomy for supervision developed by Wills and others (1997a, 1997b), who defined supervision as "the presence of a familiar person 12 years or older and at least three years older than the child being supervised who could reach the child within five seconds." They derived 10 different types of supervision by considering the presence of a designated supervisor, whether the supervisor was a teen or an adult, proximity of the supervisor to the child, and the presence of peers. Using this definition, they found that only 36% of children injured as pedestrians had been supervised. Supervision patterns were

related to such psychosocial variables as family size and cohesiveness. This study was supported by Bass and others (1995) in Cape Town, South Africa, who found that only 24% of injured children had been supervised at the time of injury. Additionally, they noted a strong relationship between childhood pedestrian injuries and playing or running errands during daylight in the late afternoon.

Other Risk Factors. A child's general experience in traffic and specific experiences with a particular circumstance or site also affect his or her capacity to make decisions such as ability to detect space between vehicles in oncoming traffic.

Adult Risk Factors

A similar group of individual factors could be listed concerning the adult driver or supervisor. These include the supervisor's knowledge of child development and how it might affect behavior and consequent risk in traffic, and the supervisor's understanding of the unique developmental capabilities and vulnerabilities of a specific child in various settings (Dunne, Asher, and Rivara 1992). Physical attributes of the driver (e.g., height, ponderosity, agility, perceptual acuity) contribute to traffic habits they develop and their moment-to-moment behaviors. Supervisors' beliefs are formed from their own experiences and local cultural norms. These in turn influence their expectations of children's behavior in traffic and their own strategies for supervision. The supervisor's personal experience with traffic, including knowledge and perceptions of risk in traffic (whether general or at a specific site) affect their interaction with children. The ability of drivers and supervisors to focus on children walking in traffic depends on other matters competing for their attention. Such distractions include noisy child passengers or concomitant use of a cellular telephone; intensity of roadway traffic; and their own emotional and physical state related to work, financial and logistical situations at home, other children, childcare arrangements, depression, fatigue, or intoxication. Finally, a child's pedestrian behavior is modeled after adults, especially parents, including where and how suddenly the adult enters the roadway, and how quickly that adult crosses the street.

Interaction of Child and Adult Risk Factors

How might individual child and adult factors interact? Four interactions with the pedestrian should be considered: the pedestrian-environment, pedestrian-vehicle, pedestrian-driver, and pedestrian-supervisor. Of these, the first two concern interactions with the adult and child.

- The pedestrian-driver interaction is affected by the physical environment and the degree to which the driver can see the child on foot (largely influenced by the child's physical attributes), the child's ability to anticipate the driver's behavior, and the driver's ability to predict the child's path based on his experience and perceptual acuity (Howarth 1995; David et al. 1986; Harrell 1994). Visibility is also affected by the degree of ambient light. Because daylight-saving time by law always begins before Halloween, children are at particular risk at the time of this celebration. Along with an increased exposure to traffic, they also have a four-fold increase in the number of pedestrian deaths that evening compared with any other evening of the year (Ferguson et al. 1995; CDC 1997).

- The pedestrian-supervisor interaction is affected by the child's family/social environment and the perception of his or her abilities in traffic by relevant adults. These influence the adult's decisions concerning when, where, and how to best supervise each child (Wills et al. 1997a, 1997b).

- The pedestrian-environment relationship is affected by how, where, and with what frequency a child walks in the community. Important factors include a child's likelihood of encountering vehicles (especially fast or large ones), supervision while walking, the number of peers crossing with him or her, and the degree to which he or she understands traffic, including the roadway structure, vehicle travel patterns, and signals (Mueller et al. 1990).
- The pedestrian-vehicle interaction is affected by how well a child can see, judge, and avoid an oncoming vehicle. The child pedestrian's ability to see the vehicle is determined by his or her height and perceptual acuity, while the ability to judge vehicle speed and traffic gap size is determined by experience, developmental level, and perceptual acuity. The ability to avoid an oncoming vehicle is determined by experience, judgment, and agility. The driver's likely response to a darting pedestrian is to swerve, while the child's likely response is to quickly retrace his or her path.

Based on the individual factors of children and adults, a useful taxonomy has been developed (Schofer et al. 1995). It classifies pedestrian injury events according to two variables: suddenness of appearance and speed of motion. To the driver, a child may appear suddenly in the road (i.e., hidden until the last moment from the driver's view) if he or she darts out between parked vehicles, is short or hidden by shrubbery or other roadside or roadway obstruction, or if the driver's attention had been distracted from the road just before the collision. A child may move quickly into traffic (generally without scanning for traffic threats in advance) if they are on a mission, hurrying to get somewhere, or playing a game that periodically spills out into the street. In the classic midblock dart-out, the child simultaneously appears suddenly and moves quickly.

The Role of Individual Risk Factors in Planning Prevention Strategies

No individual risk factor decisively predicts child pedestrian injury, therefore it is difficult to justify developing a prevention strategy based on individual risk factors for an entire population. Even if such a strategy were to be developed, its implementation would require prior identification of risk factors for each individual, a difficult and expensive task and one with potentially unintended negative psychosocial consequences. As with many other types of injuries, child pedestrian injury prevention strategies are more likely to succeed if they focus on commonly occurring adverse environmental factors, elements of supervision in or near the street by all caregivers, and are developmentally appropriate.

Key individual attributes of high-risk groups (e.g., age) should be considered when planning interventions. Environmental strategies should be aimed at the majority of those at risk, such as children whose height falls between the 10th and 90th percentiles for the high-risk age groups. Effective educational approaches are needed to teach adults about the usual capabilities and vulnerabilities of at-risk children. Norms for child conduct and supervision should be prescribed for various common traffic environments, such as supervising all preschool-age children when they cross a street.

Strategies designed to fit the most common child attributes are likely to reduce danger for every child at risk, including the most vulnerable, such as the blind, or those with combined cognitive and physical disabilities. The numbers of such children are too sparse to affect population risk. However, because the specific abilities of each child to negotiate traffic on foot may be delayed compared to his or her peers, and because the ability to walk is of such keen importance, an individual approach must be taken. Parents and other caretakers of vulnerable children need to learn what specific pedestrian risks they have as a result of their disability, and what special supervisory measures are needed.

Thus, what we know about individual pedestrian injury risk factors among children leads to a two-tier prevention strategy. The first tier should be aimed at broad subpopulations of children at risk while essentially ignoring the possibility of variable risk within these groups. The second tier should be aimed at specially vulnerable individuals using techniques modified from the first tier, but suited to each individual's needs. One might characterize these as public health and clinical prevention strategies. This kind of two-tiered approach has been adopted in other areas of child health promotion, such as the practice (until the mid-1990s) of administering live polio vaccine to the general public but inactivated polio vaccine to a select few who have a deficient immune system (Chipman 1995).

The Role of Individual Risk Factors in Planning Research

Even though considering individual risk factors may not be of paramount concern in developing population-based control measures to limit pedestrian injury risk, several such issues do deserve study, as noted below.

- Do unbalanced levels of physical and cognitive skill development contribute substantially to risk? If so, it would be desirable to help caregivers identify such persons.
- Some individual risk factors might have differing degrees of influence in different traffic environments. For example, how might risk change if the number of children walking were to suddenly increase? The number of pedestrians increased abruptly in 1993 in Amsterdam (Simons 1993), and could happen in selected environments if urban planning and/or transportation patterns change quickly and substantially. In such circumstances, the relative importance of individual risk factors should be reevaluated.
- Research is needed to design individual risk prevention approaches for those children at excess risk because of low or discordant functional developmental levels. Such research might first compare the pedestrian exposure, behavior, and supervision among younger children versus older special-needs children.
- Research is needed to evaluate the effect of community prevention approaches on injury occurrence to determine whether they reduce or even increase risk among those with special needs.
- Individual prevention strategies for children with heightened risk for pedestrian injuries should be evaluated rigorously. For example, comparisons should be made between impulsive children who receive added protective efforts with those who do not. Multi-center studies would probably be required to enroll enough of these children to achieve sample sizes adequate for multivariable hypothesis testing.
- Considering how psychological states and traffic experience contribute to pedestrian injury risk might help tailor supervision for children at times when they are less emotionally stable than normal or are unfamiliar with a traffic site or pattern.
- Much more information is needed concerning the role of adult supervision in child pedestrian injury risk, especially the chief determinants of supervision patterns and how these can be altered to increase safety. This area of research is more feasible than in the past because a useful taxonomy is now available (Wills et al. 1997b).
- Exploring behavioral mechanisms involved in pedestrian injury, including the antecedents and perceived consequences of specific behaviors, is vital. For example, children may not use a pedestrian overpass because of the delay and physical effort involved, or because they

and their peers have successfully and repeatedly run across the street without being injured. Analysis of factors influencing how children assess risk versus benefit of varying methods of crossing the street would be useful.

- Finally, all individual-based pedestrian injury research should adhere to two design standards. First, traffic exposure should be measured rigorously as a covariate. Second, pedestrian injuries and issues should be separated from those of bicycling, since their demographic and other risk factors are different.

Summary

Certain individual risk factors, such as those related to developmental level, contribute substantially to the risk of pedestrian injury. However, in the aggregate, personality and behavioral traits, including hyperactivity and impulsivity (Davidson 1987) do not appear to contribute substantially to risk among the entire child pedestrian population (particularly when analyses control for demographic variables), although they may be important in special instances. Except perhaps for height, physical attributes such as physical development and perceptual difficulties contribute very slightly to overall risk. Height needs to be taken into account when designing strategies to enhance pedestrian visibility and mutual awareness among pedestrians and drivers. Little is known about the contribution of a child's experience and psychological state to pedestrian injury risk, although emotional instability sometimes surfaces as a causal factor in individual occurrences.

Prevention efforts should be focused on issues of demography, the environment and its potential adaptations, and supervision. Separate attention should be paid to the needs of children with cognitive and/or physical disabilities that can put them at greater risk. A research program should emphasize a better understanding of the role of supervision, various psychological states of the child, and the needs of disabled children. Exposure should be measured in all such studies.

Response
Individual Risk Factors

David DiLillo, PhD

I would like to address two main points. First, how well can we expect environmental changes to work to reduce unintentional injuries? And second, what do we know about how parents supervise their children to prevent injury?

Environmental alterations can often provide an effective means of protecting children from pedestrian injuries, so it makes sense to focus our initial attempts there. After all, it is much easier to construct a physical barrier or make some other type of environmental modification than it is to change people's behavior. Unfortunately, environmental modifications have several limitations. First, given the range of circumstances of pedestrian injury events, no set of physical barriers or environmental changes will prevent all such occurrences. Second, our society greatly values economic and aesthetic matters, sometimes to the detriment of safety. For example, a hedge may be planted by the side of a road to enhance local beauty even though it obstructs a driver's view of the side of the road and endangers child pedestrians trying to cross there. Finally, environment-oriented solutions may not be implemented prudently, and may not consider human behavioral or social issues. For example, a large park with a playground and basketball court was built near the center of Columbia, Missouri across the street from a public housing development. Anticipating that these residents would be the principal users of the park, a pedestrian overpass was constructed. Of the four child pedestrians in that town struck by cars during the past several years, three were injured at this site. Inquiries later established that children considered the number of stairs required to climb this overpass to be excessive (even though they were going to a playground), so they preferred to dart across the road. Their cumulative success in crossing the road in that manner reduced their fear of being struck by a vehicle, further reducing the likelihood of using the overpass. Such behavioral and social mechanisms of environmental interventions need to be considered.

How do parents actually supervise their children in high-risk situations? What are the proper elements and degrees of supervision needed to prevent injuries at each developmental age? Parents are widely regarded as the key socialization agents for their children, assuming primary responsibility for their children's physical safety. However, Garbarino (1988) notes that inadequate supervision by parents is responsible for a sizeable proportion of children's unintentional injuries. And yet, we know very little about what constitutes appropriate parental supervision of children in various situations (including street crossings) across a range of risks.

The most basic question regarding supervision is how long and under what circumstances children at each age can be safe when left without any adult supervision. Finding nothing in the literature to address this question, Peterson and colleagues asked physicians, Department of Family Service (DFS) workers, and mothers to give their opinion about the elements of appropriate parental supervision (Peterson, Ewigman, and Kivlahan 1993). Each group was asked how many minutes they would leave children of various ages alone in various locations, including the roadway, kitchen, and garage. Although it was expected that greater consensus would occur among DFS workers and physicians because they had access to injury literature and possessed some expertise in safety issues, no such consensus was found. For example, children younger than seven years probably do not have the necessary skills to walk alone across a street under any circumstances. Even so, several respondents reported that they would allow a four-year-old child to cross a street without adult supervision in sparse traffic. Others considered it acceptable for a six-year-old child to do so in medium levels of traffic. With professionals apparently overestimating children's abilities to perform risky tasks, it is hard to imagine how parents might answer questions about simpler tasks, such as letting a young child cross a street with a parent but without holding his or her hand, or letting a child walk ahead of a parent in a crosswalk.

How and when should parents teach and train children about safety and injury prevention? Some studies suggest that the most common ways parents try to influence their children's safety behavior are through education and establishing rules, rather than by using discipline or the threat of negative consequences, even though the latter two are more effective in motivating behavior change in children. Using vignettes that provided common excuses children give for not wearing a bicycle helmet, we studied techniques parents would use to promote helmet use. Mothers of 2nd and 8th graders read these vignettes with their children, and then reacted to them. Initially, regardless of the excuse made, mothers tended to invoke a rule or begin a safety discussion with their child. They did not, however, name an unpleasant consequence for non-use, a tactic known to induce behavior change of children more effectively. If a child would continue to refuse to wear a helmet, the likelihood of consequences increased. However, in the end, a sizable minority of parents ultimately would have allowed their child to ride without wearing a helmet. These findings suggest that caregivers are reluctant to implement some of the most effective means known to encourage children to abide by safety rules.

To sum up, prevention specialists need to explore all possible avenues to ensure the safety of child pedestrians. To do so, we need to go beyond environmental barriers and consider other social and behavioral factors that underlie children's injuries. Caregiver supervision is one such factor. Some important questions still need to be addressed. What kind of caregiver interventions are most effective in preventing injuries among children at each level of cognitive, social, and affective development? What parenting skills, abilities, and habits are best matched with each type of preventive intervention? When are children most receptive to learning safety interventions? When does the best teaching moment occur; before the child gets injured, or immediately after, but before he or she forgets the injury event? Finally, it would be useful to develop a standardized instrument to assess parental supervision in risky situations. Such an instrument could be used to teach parents what level of supervision is required for different ages, activities, and circumstances.

Open Discussion
Individual Risk Factors

H. Spivak: We talk about interventions that help change attitudes, but there isnít always a direct link between changing an attitude and changing a behavior. Strategies need to deal with factors, attitudes and behaviors. They may not always follow the sequence we expect.

S. Flocks: I think you may be writing off the potential value of engineering solutions by picking out the worst examples. Pedestrian bridges like the one you described are now seen as mistakes by the most knowledgeable and progressive engineers, who would now favor precisely the interventions you suggested. Also, expecting a high level of supervision is unrealistic in a society where most women work and where we have a lot of single parent families.

Unidentified: In discussing supervision, we seem to keep coming back to the sexist model that the supervisor has to be the mother. These days, I don't think that is correct. Also, supervision should not be the sole mode of protecting children in traffic, although it should be one component of a comprehensive, community-wide intervention strategy. Children of certain ages in certain situations need to be supervised. We need to think more broadly about solutions.

Unidentified: Environmental engineering solutions should be our first line of defense against pedestrian injuries. They are the most cost-effective and successful. However, they do have limita tions and, unfortunately, many outmoded methods of barrier intervention still exist, such as the pedestrian overpass you cited. For this reason, it is important to replace such misguided engineering efforts. It is also important to supplement effective environmental interventions with those targeting social and behavioral factors associated with injury.

M. Stevenson: I think that child pedestrian injuries are a matter of mass exposure. If most children were walking, they would all be exposed to road hazards, and the problem would likely be perceived as an environmental one; conducting community environmental interven tions would be favored over identifying and targeting selected at-risk children.

K. Christoffel: Children are at risk for pedestrian injury simply because they are children. They need to be protected from pedestrian injury in all the ways we have been discussing. In addition, some children are at higher risk than others due to geography or social class, and we need to focus on them. Finally, some children are at an astronomically higher risk in traffic because they have a rare circumstance or condition, such as the child with cerebral palsy or poor vision. Population-based approaches will probably not suffice for such children with special health-care needs. Preventive care, like health insurance, should be universal, but a few will need special assistance.

B.Wilkinson: We need to consider adapting better to children, rather than changing them to our standards. That population has a rapid, constant turnover, which makes it difficult to deliver a program to them. We need to pay a lot more attention to the motor vehicle operator. Our studies have shown that one out of 10,000 potential accidents to 5-year-old boys is being avoided, as is one out of 100,000 potential crashes to 10-year-olds. These studies show that children, rather than drivers, took avoidance action when the vehicle was more than 20 yards away. Thus, drivers appear to be abdicating this responsibility to the child, who is expected to do whatever is necessary to avoid the crash. That is something we have to factor in when we target specific interventions.

M. Fenton: The ability to explore is important to a child's cognitive development. As a health promoter, I believe that kids need a lot of physical activity in their daily life. This creates a potential conflict between the natural desire to keep a child safe in a controlled setting versus allowing him or her to spend time in some unsupervised activity crucial to development.

K. Christoffel: I don't think supervision is a restraint, just as I don't see discipline as a restraint. Discipline is helping the child learn the things a child needs to learn. It's not sitting on the kid, it's facilitating their learning behavior. Similarly, supervision means the adult is exercising responsibility to make sure children are safe to do the exploring they need to do. Those requirements vary by the age of the child, the situation, the particular attributes of the traffic environment, and the child's needs. If we say that supervision entails a loss of freedom, there is a clash. If we see supervision and discipline as factors that need to work together to the child's benefit, there is no contradiction.

D. DiLillo: We recently studied parents' attitudes about the way children explore their environment, and found that most parents endorsed letting their child explore, even at the risk of getting a little hurt sometimes. We are not sure if the parents' attitudes correlate with their actual behavior, but if so, that issue needs to be addressed.

I. Roberts: Road Peace is a group of British mothers of children who died in pedestrian injuries. Each of these mothers has had to deal with the feeling that the child's death was her own fault. If the public health focus is on supervision as one of the most important countermeasures, when a child dies, will the grieving parents then be left with that horrible thought? How can we recommend better supervision without inducing enormous guilt?

K. Christoffel: It's not just the mother's job to supervise her child. It's the job of every adult in the community to make sure children are safe. That involves a collective approach to supervision, which means if I'm working near your kid, I'll take care of your kid's needs. So, if a child gets hit by a car, the community has not supervised that child well. In isolated situations, it may be that a particular supervisor will have failed, but the presumption that this huge societal burden is uniquely the responsibility of the mother every moment of her day is crazy.

B. Alberson: Another way to frame that idea is as other layers of protection.